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RESULTS OF THE RADIATION MEASUREMENTS TAKEN OF
TRANSPORTATION ROUTES (LM004) IN HAZELWOOD, MISSOURI

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HEALTH AND SAFETY RESEARCH DIVISION

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RESULTS OF THE RADIATION MEASUREMENTS TAKEN OF
TRANSPORTATION ROUTES (LM004) IN HAZELWOOD, MISSOURI

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Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

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RESULTS OF THE RADIATION MEASUREMENTS TAKEN OF TRANSPORTATION ROUTES IN HAZELWOOD, MISSOURI*

INTRODUCTION

Radiation measurements were performed by a survey team from Oak Ridge National Laboratory (ORNL) along selected transportation routes in Hazelwood, Missouri, during December 2-6, 1985. These routes (Pershall Road, Hazelwood Blvd., and McDonnell Blvd.) were suspected of having been used to transport radioactive residues to and from the St. Louis Airport Storage Site (SLAPSS) and the former Cotter Corporation site and were identified during the mobile gamma scan¹ of Hazelwood, Missouri as exhibiting higher than normal background gamma radiation levels.

The radiation measurements taken on these areas were for the purpose of determining whether the properties had any radioactive material onsite in excess of remedial action guidelines established by the Department of Energy (DOE) such that the properties could be "designated" for further investigation. This report summarizes the results of the "designation" survey performed along these routes.

SURVEY METHODS

The radiological survey of the transportation routes included: (1) a gamma scan along shoulders of the roads; and (2) sampling of surface (0-15 cm) and subsurface (15-45 cm) soil. A comprehensive description of the survey methods and instrumentation has been presented in another report.²

SURVEY RESULTS

The normal background levels for the St. Louis, Missouri area are presented in Table 1. These data are provided for comparison with the survey results presented in this section. All direct measurement results presented in this report are gross readings at ground surface;

* The survey was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400.

background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations measured in environmental samples.

Gamma Radiation Levels

Results of the gamma scan of the roadsides showed where gamma exposure rates are in excess of background radiation levels. Locations and exposure rates are shown in Figs. 1-3, and a summary is provided in Table 2. Gamma exposure rates up to 90 $\mu\text{R/h}$ exist on the surface at McDonnell Blvd.

Soil Samples

Soil samples were taken in areas exhibiting higher than normal gamma radiation levels. Locations of the samples are shown in Figs. 1-3 with results of laboratory analyses provided in Table 3. Concentrations of ^{226}Ra , ^{230}Th , and ^{238}U in all soil samples, surface and subsurface, exceeded the normal background concentrations of ^{226}Ra , ^{230}Th , and ^{238}U anticipated for the St. Louis, Missouri area. The major radionuclide contaminant is ^{230}Th with the highest level, 3500 ± 90 pCi/g, occurring in sample LM4B1A. Samples LM4B8 and LM4B9 indicate increasing radionuclide concentrations with depth.

SUMMARY

Measurements taken along the suspected transportation routes in Hazelwood, Missouri, indicate the properties contain radioactive contamination primarily from the ^{238}U decay chain. The addresses given in Table 2 are for location purposes only. All anomalies appear to be located on the State Highway Department and City Highway Department right-of-ways. This material was found in the locations shown in Figs. 1-3. Based on the analyses of soil samples, it is believed that this material results from the transportation of radioactive residues to and from the St. Louis Airport Storage Site (SLAPSS) and the former Cotter Corporation.

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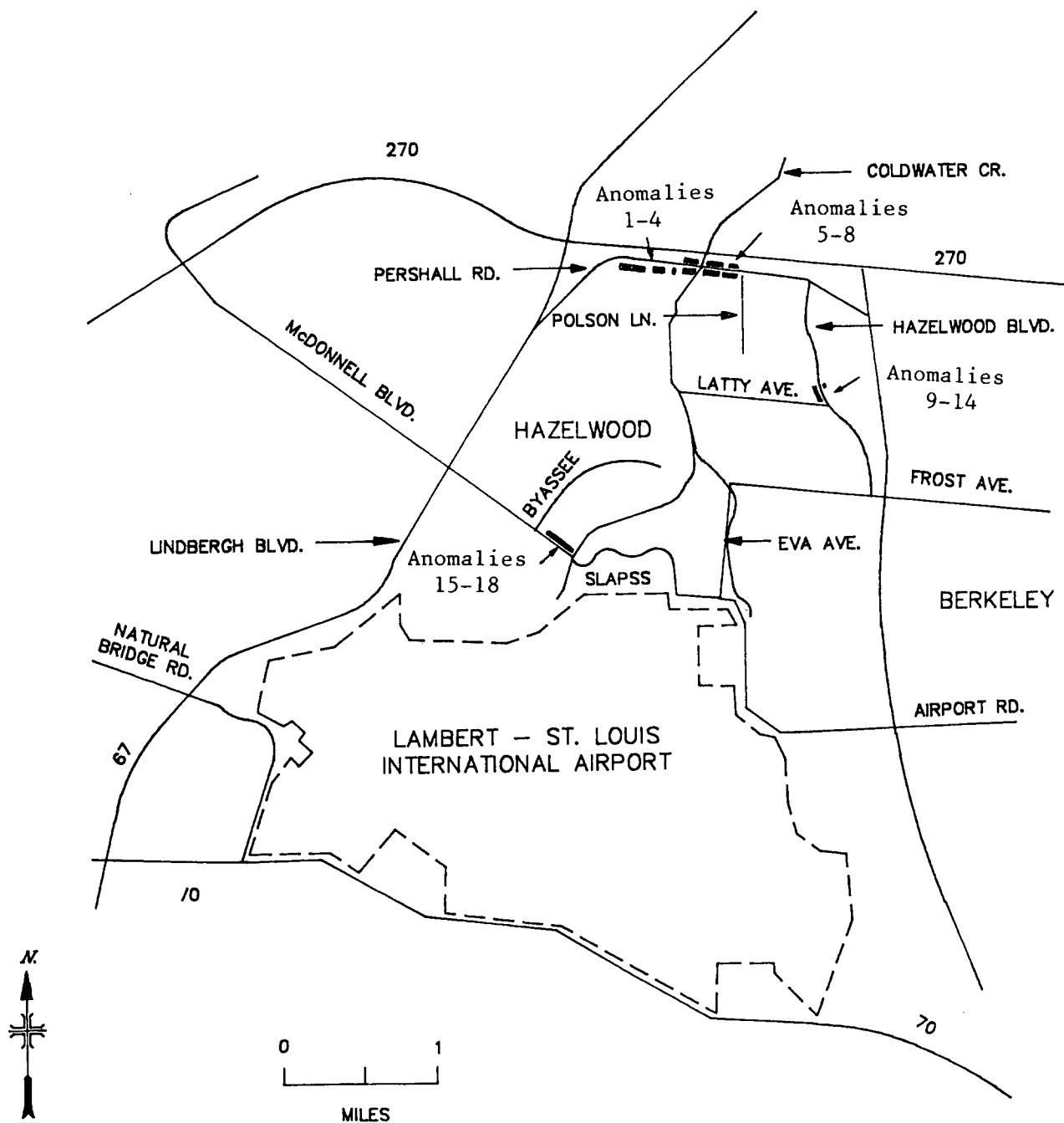


Fig. 1. Locations of gamma exposure rates along roadways in Hazelwood, Missouri.

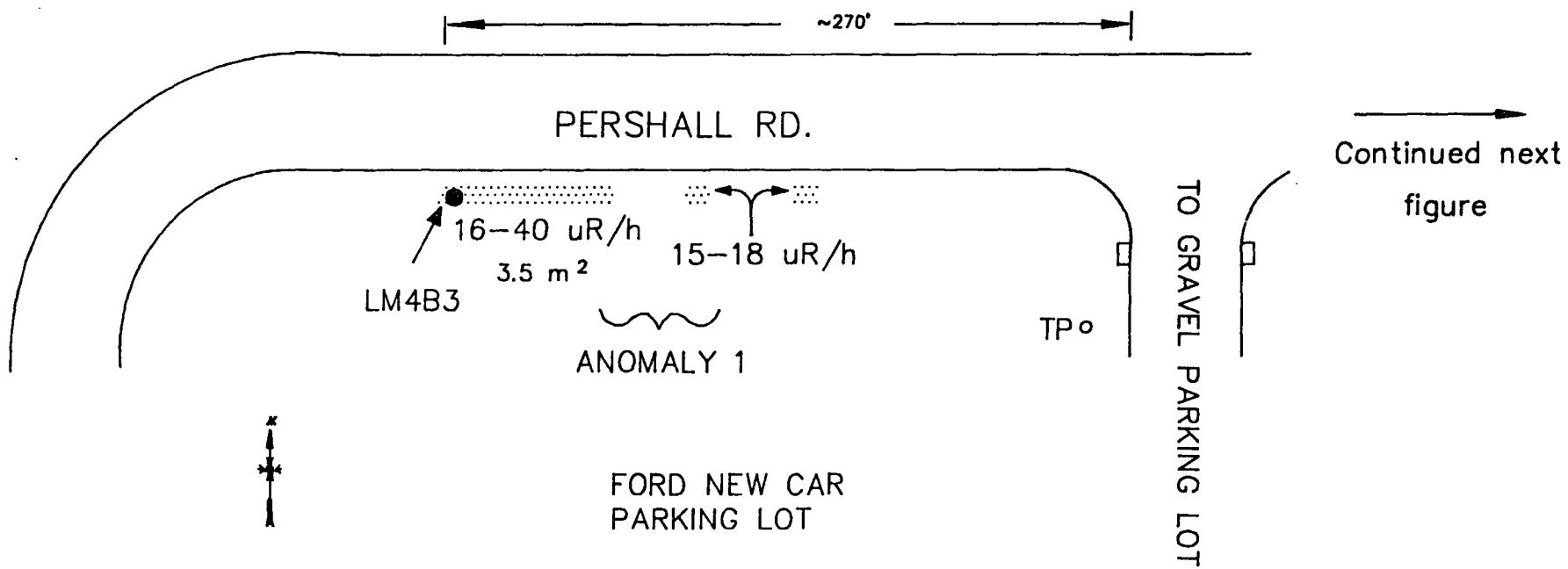


Fig. 1a. Locations of gamma exposure rates and soil sampling areas along Pershall Road, Hazelwood, Missouri.

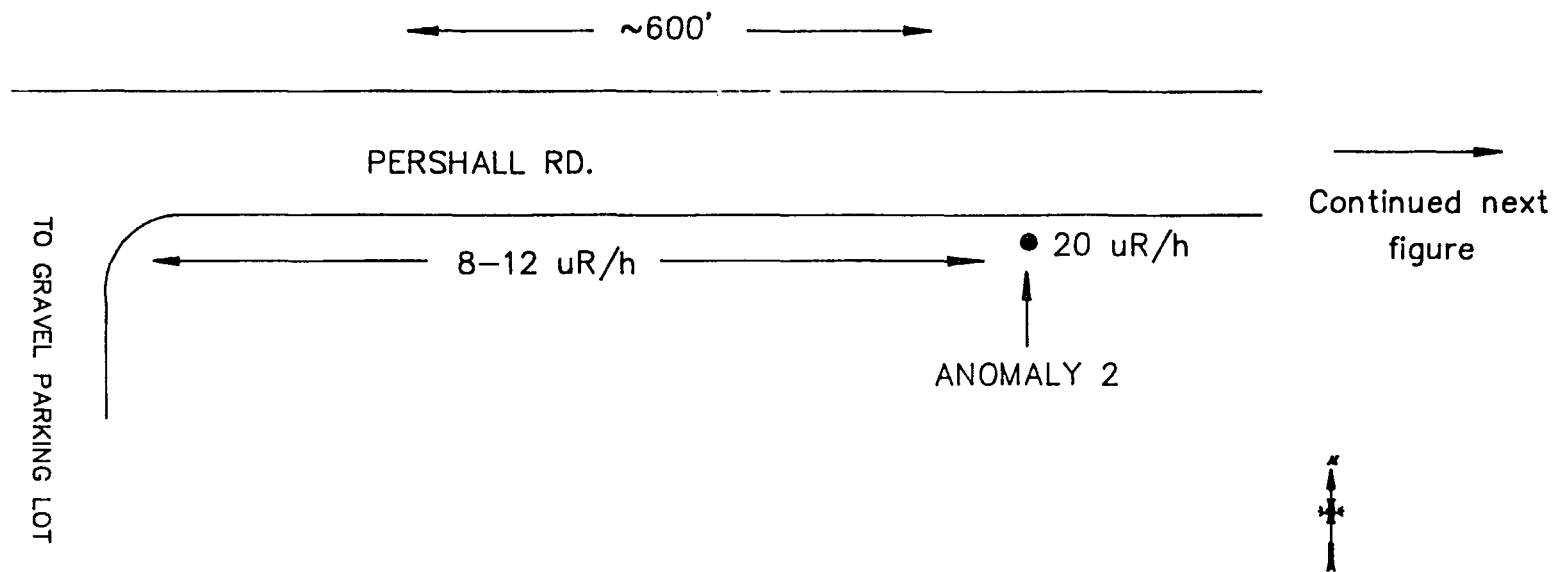


Fig. 1b. Locations of gamma exposure rates along Pershall Road, Hazelwood, Missouri

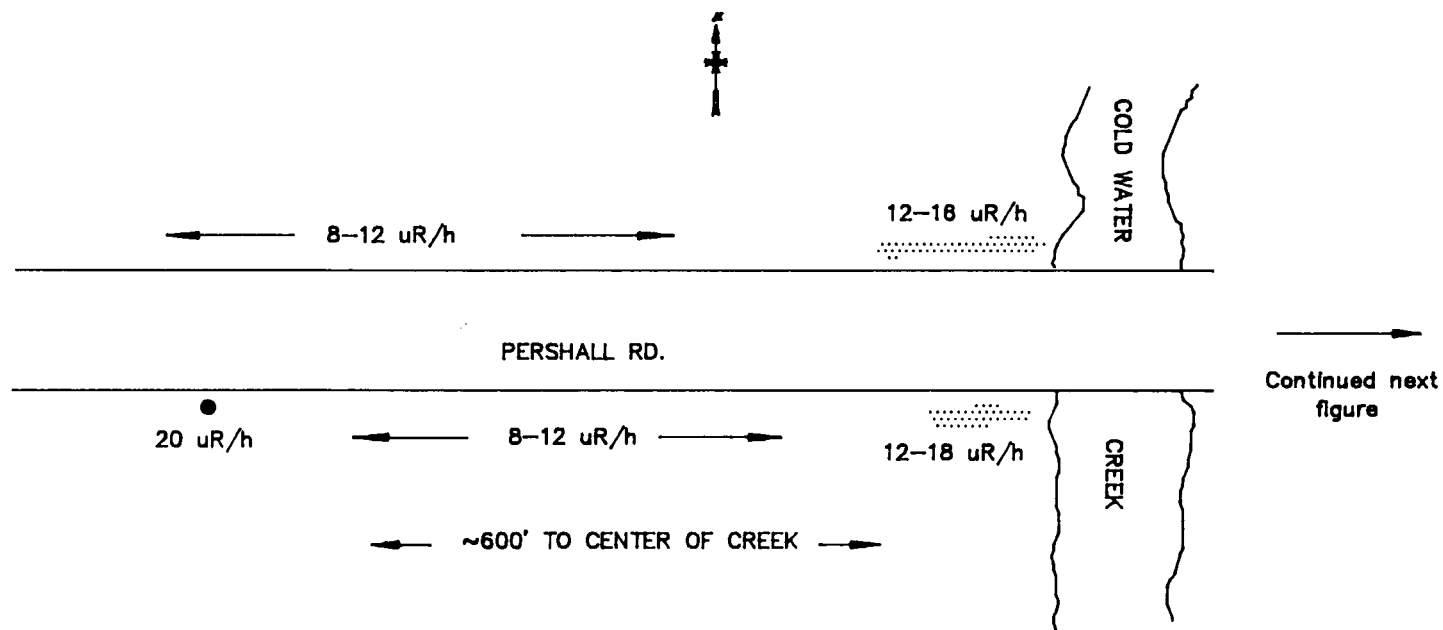


Fig. 1c. Locations of gamma exposure rates along Pershall Road, Hazelwood, Missouri.

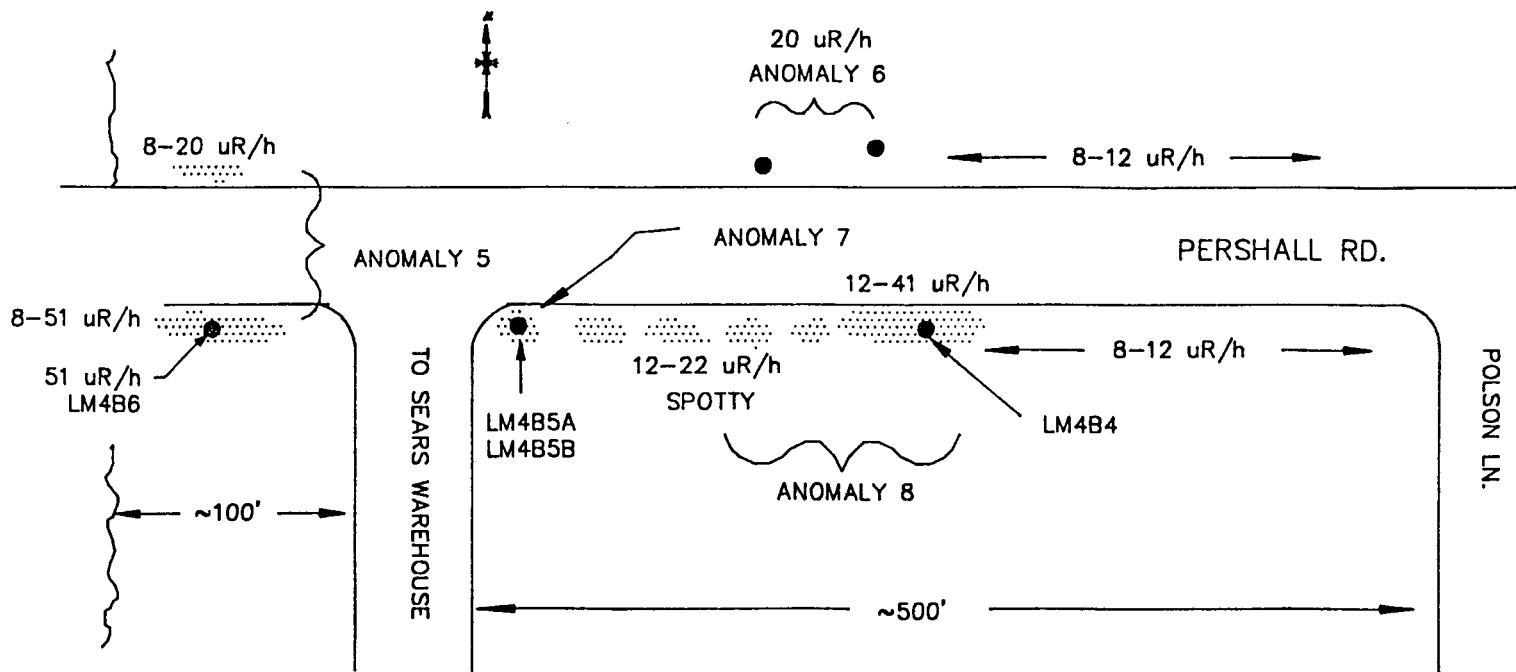


Fig. 1d. Locations of gamma exposure rates and soil sampling areas along Pershall Road, Hazelwood, Missouri.

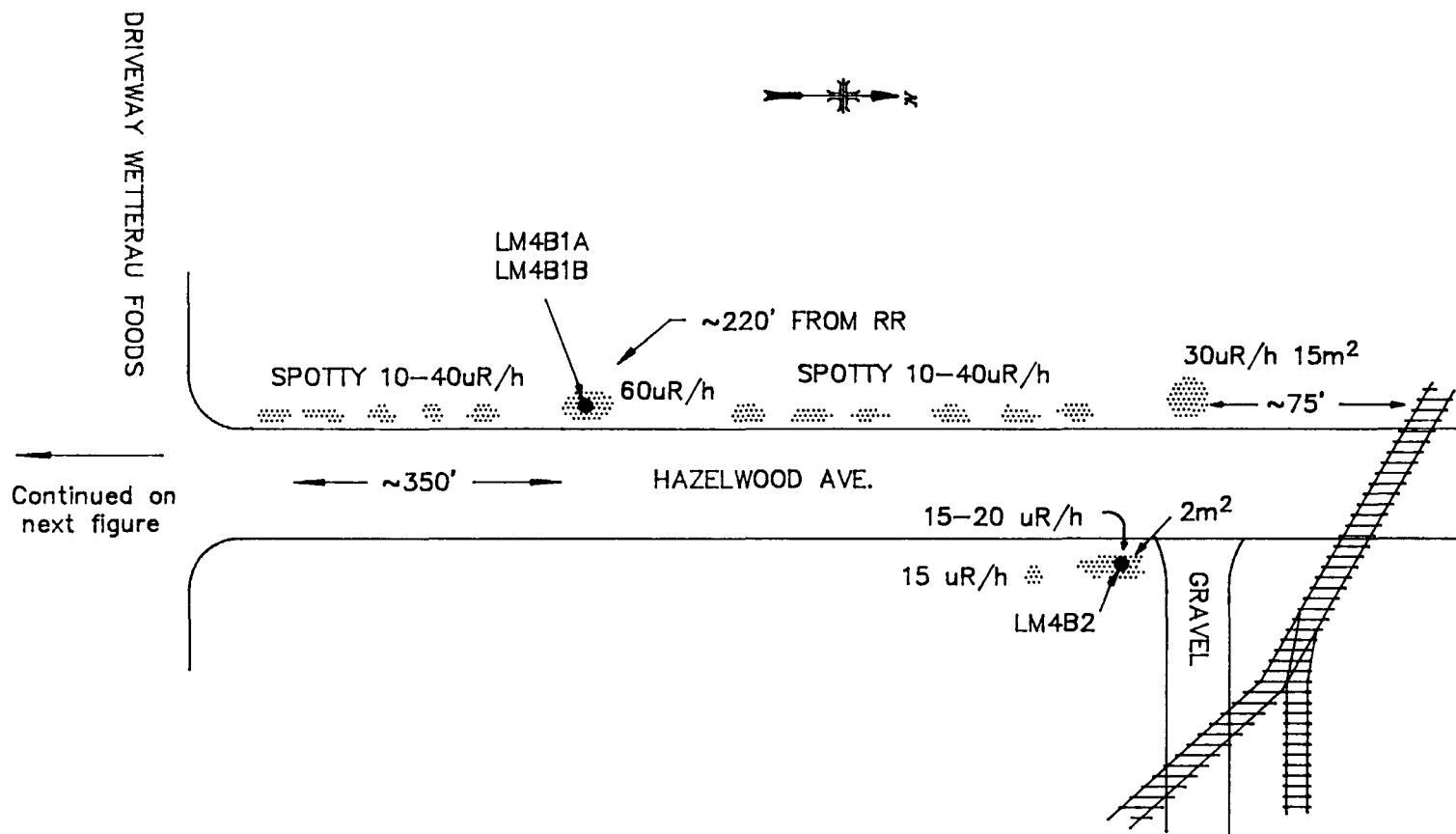


Fig. 2a. Location of gamma exposure rates and soil sampling areas along Hazelwood Avenue, Hazelwood Missouri.

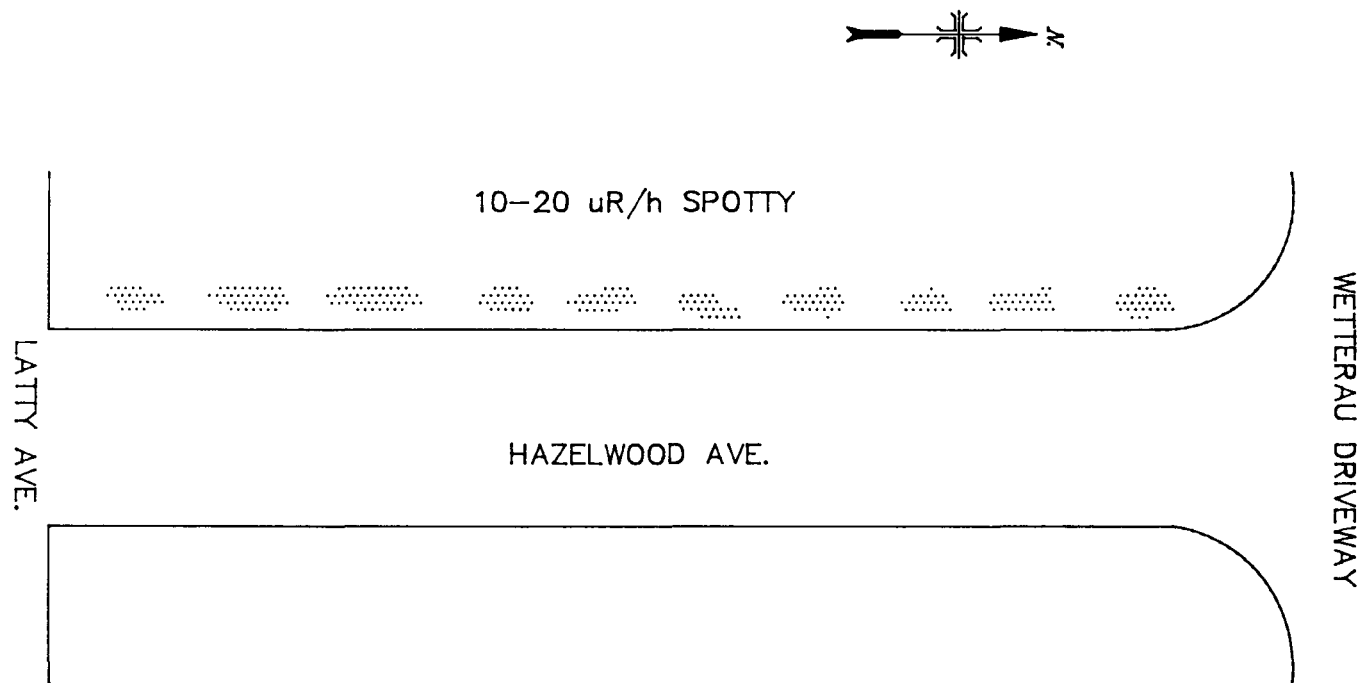


Fig. 2b. Locations of gamma exposure rates along Hazelwood Avenue, Hazelwood, Missouri.

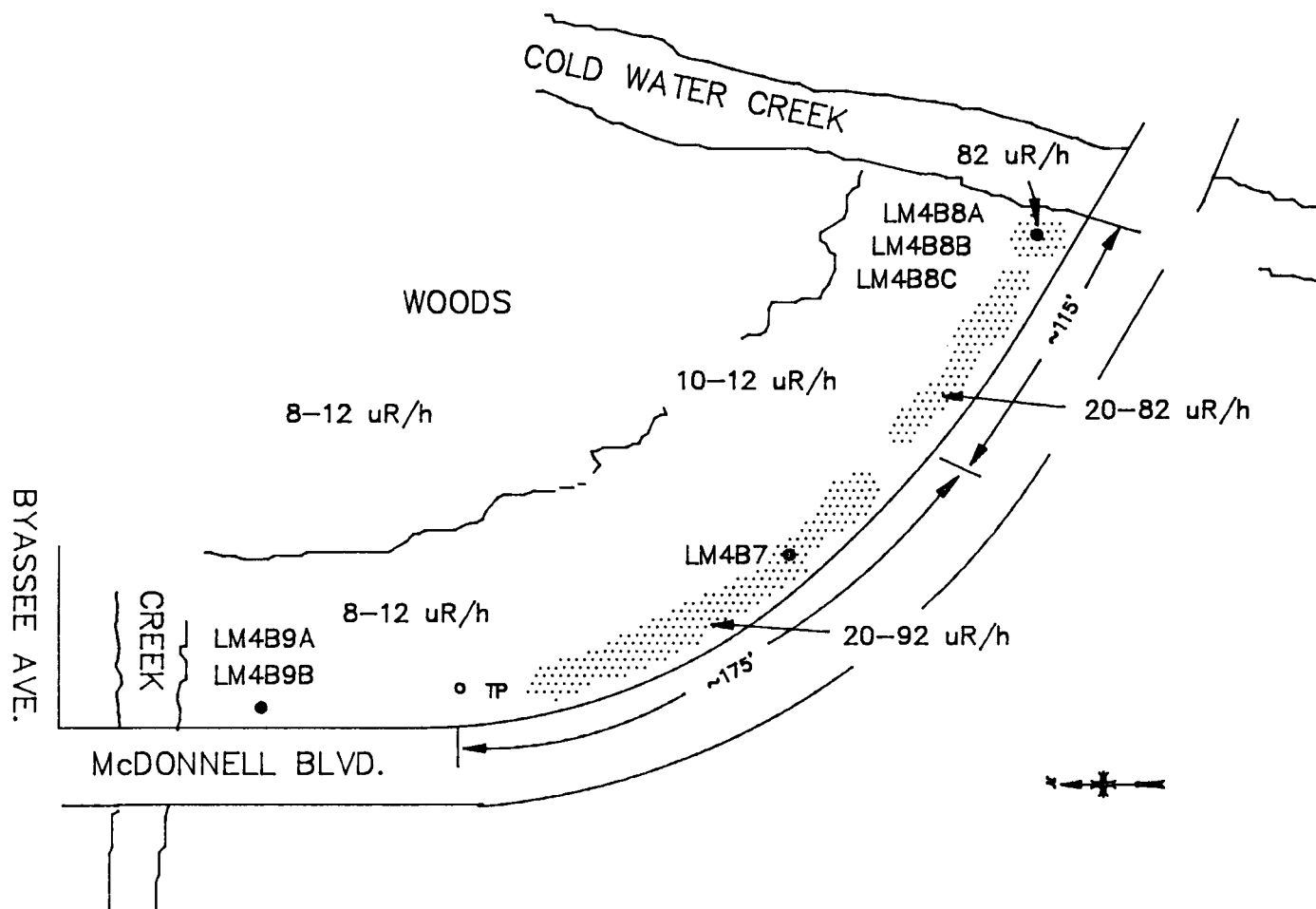


Fig. 3. Locations of gamma exposure rates and soil sampling areas along McDonnell Blvd., Hazelwood, Missouri.

Table 1. Background radiation levels for the Hazelwood, Missouri area.

Type of radiation measurement or sample	Radiation level or radionuclide concentration
Gamma exposure rate at 1 m above floor or ground surface ($\mu\text{R/h}$) ^a	6
Concentration of radionuclides in soil (pCi/g) ^b	
²³⁰ Th	0.91
²³⁸ U	0.91
²²⁶ Ra	0.96

^aReference 3.^bReference 4.

Table 2. Results of measurements taken along roadsides in Hazelwood, Missouri

Anomaly	Description ^a	Approximate location ^b	Range of gamma exposure rates ($\mu\text{R/h}$)	Concentrations of radionuclides in surface soil (pCi/g)		
				²²⁶ Ra	²³⁰ Th	²³⁸ U
1	South side of Pershall Road	Ford Motor Co. 6250 Pershall Rd. Hazelwood, MO (new car parking lot)	15-40	25 \pm 4	1300 \pm 30	13
2	South side of Pershall Road	Ford Motor Co 6250 Pershall Rd. Hazelwood, MO (new car parking lot)	20		c	
3	South side of Pershall Road	No address	20		c	
4	North and south side of Pershall Road at west side of Coldwater Creek	No address	12-18		c	
5	North and south side of Pershall Road at east side of Coldwater Creek	Sears warehouse 8950 Pershall Rd. Hazelwood, MO	8-51	12 \pm 2	540 \pm 15	11
6	North side of Pershall Road (spotty)	Sears warehouse 8950 Pershall Rd. Hazelwood, MO	20		c	
7	South side of Pershall Road at entrance to Sears warehouse	Sears warehouse 8950 Pershall Rd. Hazelwood, MO	12-22	27 \pm 7	1300 \pm 30	17
8	South side of Pershall Road	Sears warehouse 8950 Pershall Rd. Hazelwood, MO	12-41	17 \pm 4	720 \pm 20	21
9	West side of Hazelwood Avenue (spotty)	Wetterau 7101 Hazelwood Ave. Hazelwood, MO	10-40		c	

Table 2. (Continued)

Anomaly	Description ^a	Approximate location ^b	Range of gamma exposure rates ($\mu\text{R/h}$)	Concentrations of radionuclides in surface soil (pCi/g)		
				²²⁶ Ra	²³⁰ Th	²³⁸ U
10	West side of Hazelwood Avenue ~220 ft south from railroad Hazelwood, MO	Wetterau 7101 Hazelwood Ave.	60	65 ± 10	3500 ± 70	17
11	West side of Hazelwood Avenue (spotty) Hazelwood, MO	Wetterau 7101 Hazelwood Ave.	10-40		c	
12	West side of Hazelwood Avenue ~75 ft south from railroad (15 m ²)	Wetterau 7101 Hazelwood Ave. Hazelwood, MO	30		c	
13	East side of Hazelwood near gravel road (2 m ²) Hazelwood, MO	Wetterau 7101 Hazelwood Ave.	15-20	13 ± 4	500 ± 15	9.4
14	West side of Hazelwood Avenue (spotty) Hazelwood, MO	Wetterau 7101 Hazelwood Ave.	10-20		c	
15	East side of McDonnell Blvd.	No address	15	6.4 ± 1	260 ± 10	3.3
16	East side of McDonnell Blvd.	No address	20-92	63 ± 20	2700 ± 60	50
17	East side of McDonnell Blvd.	No address	20-82		c	
18	East side of McDonnell Blvd.	No address	82	41 ± 10	1800 ± 45	24

^aSee Figures 1-3.^bApproximate address for location purposes only. All anomalies are on the state highway right-of-way.^cSample not taken.

Table 3. Concentrations of radionuclides in soil along transportation routes in Hazelwood, Missouri

Sample ^a	Depth (cm)	Radionuclide concentration (pCi/g)		
		²²⁶ Ra ^b	²³⁰ Th ^b	²³⁸ U ^c
<u>Biased samples</u>				
LM4B1A	0 - 15	65 ± 10	3500 ± 70	17
LM4B1B	15 - 25	15 ± 0.7	770 ± 20	10
LM4B2	0 - 13	13 ± 4	500 ± 15	9.4
LM4B3	0 - 15	25 ± 4	1300 ± 30	13
LM4B4	0 - 15	17 ± 4	720 ± 20	21
LM4B5A	0 - 15	27 ± 7	1300 ± 30	17
LM4B5B	15 - 20	2.3 ± 0.2	50 ± 5	2.1
LM4B6	0 - 15	12 ± 2	540 ± 15	11
LM4B7	0 - 15	63 ± 20	2700 ± 60	50
LM4B8A	0 - 15	41 ± 10	1800 ± 45	24
LM4B8B	15 - 30	58 ± 10	2100 ± 45	27
LM4B8C	30 - 45	74 ± 10	2300 ± 50	14
LM4B9A	0 - 15	6.4 ± 1	260 ± 10	3.3
LM4B9B	15 - 25	6.9 ± 1	290 ± 10	4.9

^aLocations of soil samples are shown on Fig. 1.

^bIndicated counting error is at the 95% confidence level ($\pm 2 \sigma$).

^c Total error of measurement results is less than $\pm 5\%$ (95% confidence level).

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